

Supplementary Material

Twelve-Month Visual, Refractive, and Ocular Wavefront Outcomes of SmartSight KLEx on the SCHWIND ATOS: A Single-Surgeon Cohort Study

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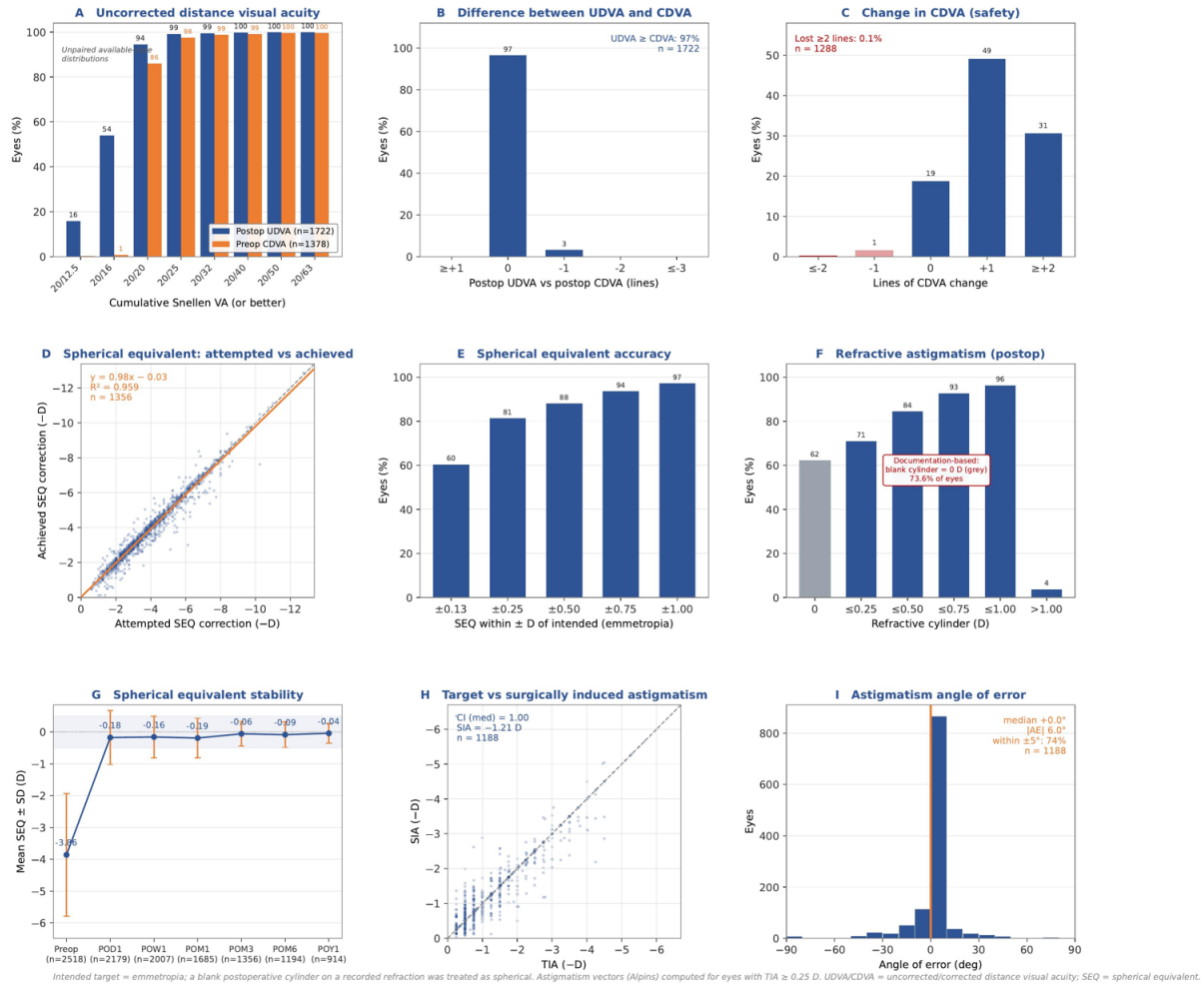
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Contents: Supplementary Figure S1 (3-month standard graphs); Supplementary Figure S2 (trefoil and coma vs correction); Supplementary Figure S3 (measurement-subset comparison); Supplementary Table S4 (higher-order aberration change estimates with 95% confidence intervals); Supplementary Table S5 (3- and 6-month higher-order aberrations); Supplementary Figure S6 (representative wavefront and tomography).

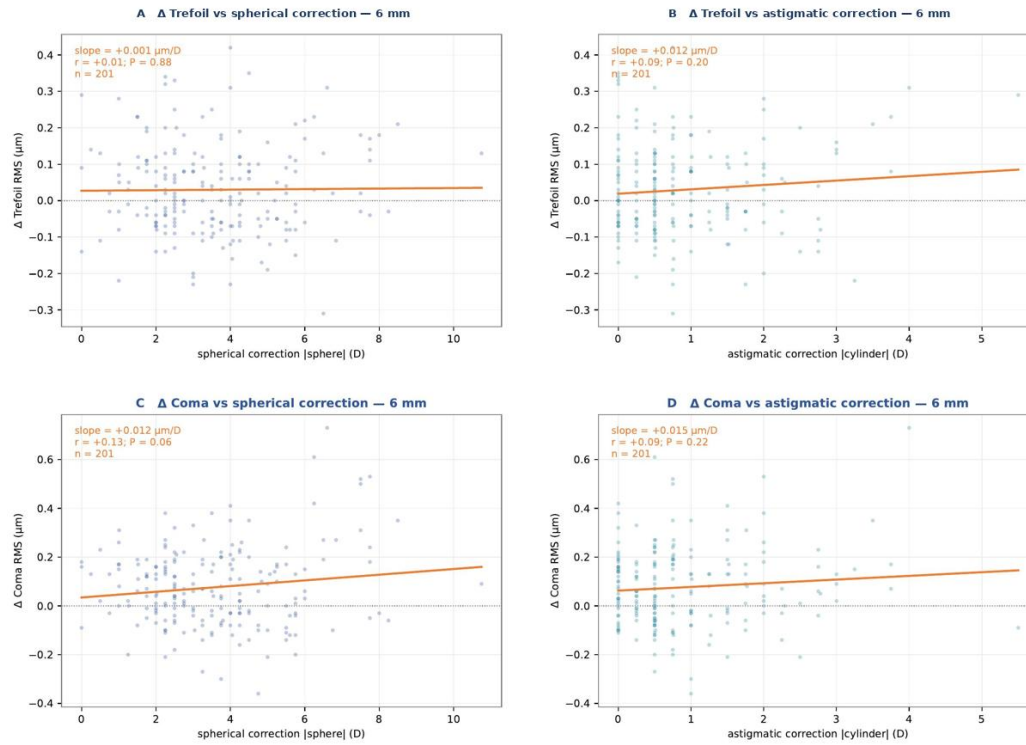
Supplementary Figure S1.

Standard graphs for reporting refractive surgery at the 3-month secondary endpoint for the KLEx cohort (SCHWIND ATOS). Panels correspond to those in Figure 2: (A) cumulative uncorrected distance visual acuity, (B) UDVA versus CDVA, (C) change in CDVA, (D) attempted versus achieved spherical equivalent, (E) SEQ accuracy, (F) postoperative refractive astigmatism, (G) SEQ stability, (H) target versus surgically induced astigmatism, (I) astigmatism angle of error.



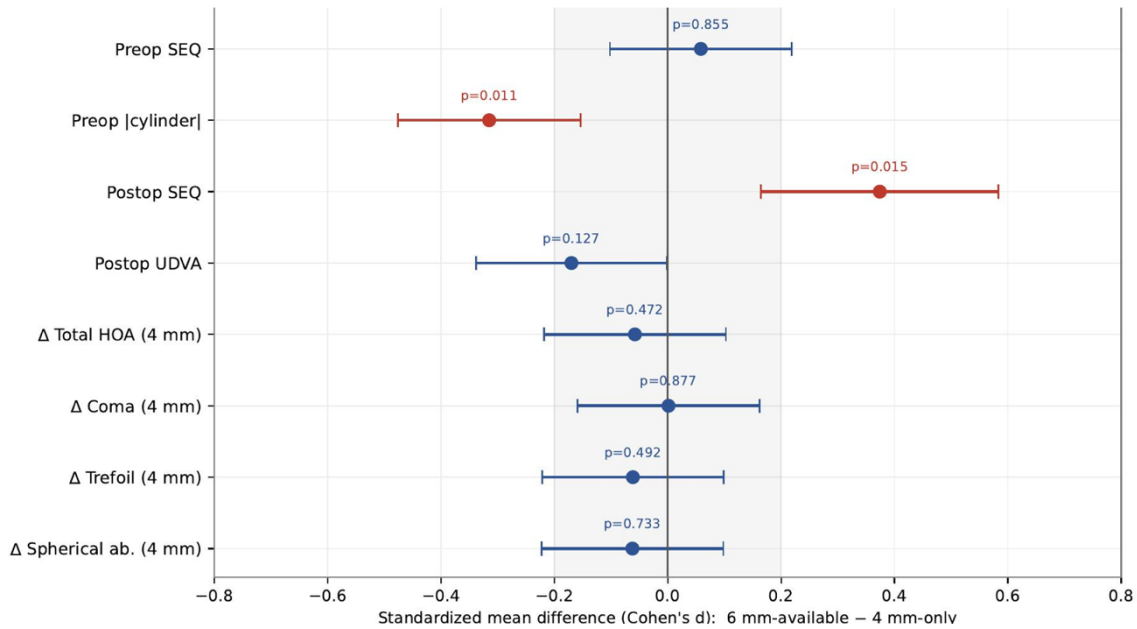
Supplementary Figure S2.

Trefoil and coma change by magnitude of spherical and astigmatic correction at 12 months (6 mm pupil zone). At 12 months neither trefoil (top row) nor coma (bottom row) was significantly associated with the magnitude of spherical or astigmatic correction. Δ = 12-month – preoperative.



Supplementary Figure S3.

Comparison of measurement subsets (eyes measured at 6 mm versus those measured only at 4 mm) at 3 months. Points are standardized mean differences (Cohen's d); red = significant ($p < 0.05$, patient-clustered GEE), blue = not significant. The 4 mm aberration responses did not differ between subsets.



Supplementary Table S4.

Estimates and 95% confidence intervals for the preoperative-to-12-month change in ocular and corneal higher-order aberrations (μm), patient-clustered, spherical aberration sign-corrected.

Metric	Change (Δ)	95% CI	P	n
Total HOA RMS, 4 mm	+0.039	+0.029 to +0.048	<0.001	412
Coma RMS, 4 mm	+0.022	+0.016 to +0.029	<0.001	412
Trefoil RMS, 4 mm	+0.020	+0.012 to +0.028	<0.001	412
Spherical aberration Z(4,0), 4 mm	-0.028	-0.032 to -0.024	<0.001	412
Total HOA RMS, 6 mm	+0.023	-0.004 to +0.051	0.098	412
Coma RMS, 6 mm	+0.031	+0.012 to +0.050	0.001	412
Trefoil RMS, 6 mm	-0.005	-0.021 to +0.011	0.554	412
Spherical aberration Z(4,0), 6 mm	-0.059	-0.073 to -0.044	<0.001	412
Corneal total HOA RMS, 6 mm	+0.193	+0.150 to +0.236	<0.001	409
Corneal coma RMS, 6 mm	+0.132	+0.105 to +0.158	<0.001	409
Corneal spherical aberration Z(4,0), 6 mm	-0.007	-0.035 to +0.020	0.594	409

Δ = 12-month – preoperative. Estimates and confidence intervals from patient-clustered generalized estimating equations / cluster-robust regression. Spherical aberration is signed Z(4,0), OSA/ANSI, reported with corrected polarity.

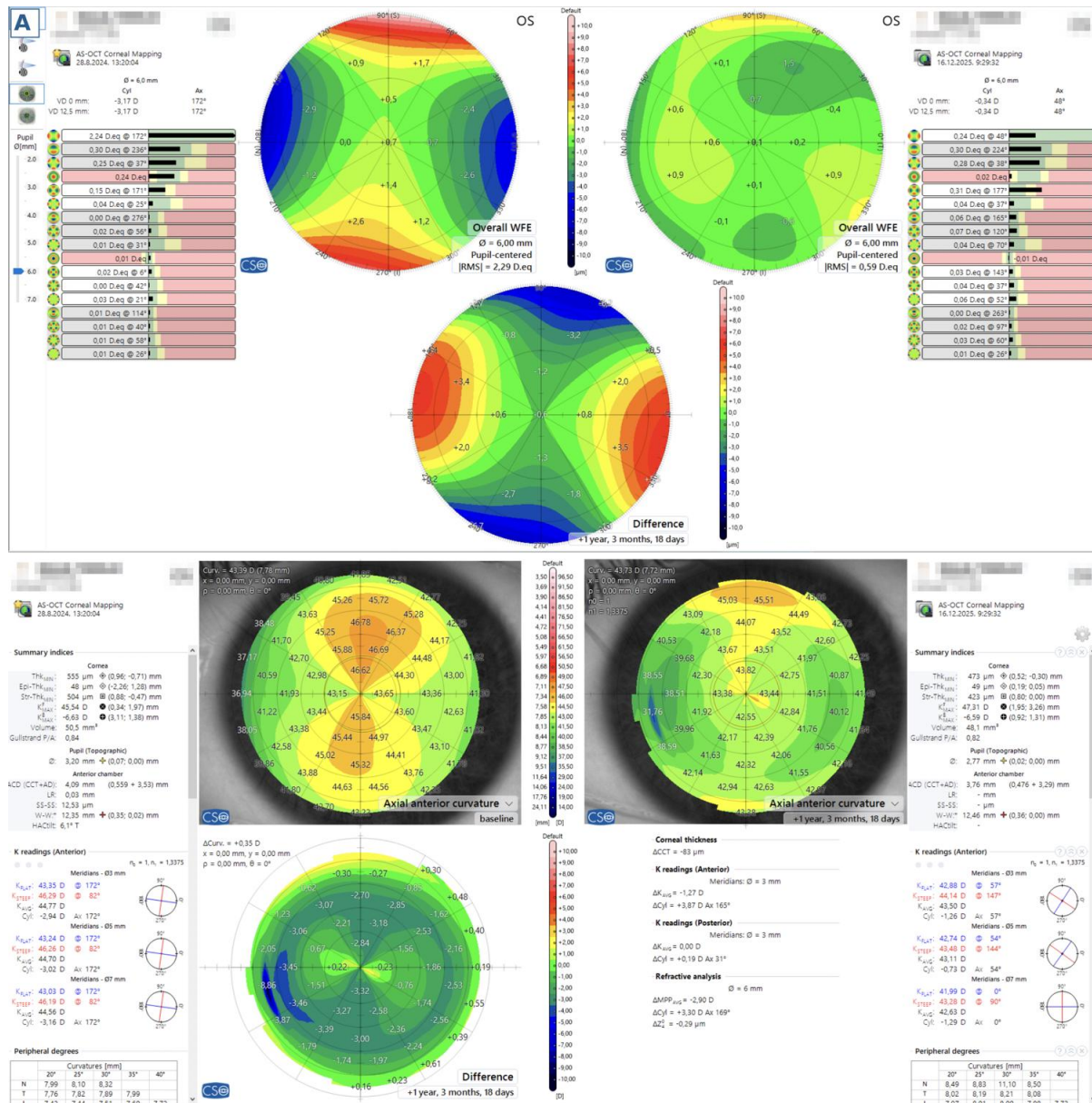
Supplementary Table S5.

Ocular and corneal higher-order aberrations (μm) at 3 and 6 months versus preoperative and 12 months, spherical aberration sign-corrected.

Metric	Preop	3 months	6 months	12 months	P (trend)
Total HOA RMS, 4 mm	0.145 ± 0.048	0.191 ± 0.079	0.186 ± 0.079	0.182 ± 0.089	0.083
Coma RMS, 4 mm	0.066 ± 0.040	0.096 ± 0.059	0.093 ± 0.058	0.089 ± 0.062	0.069
Trefoil RMS, 4 mm	0.066 ± 0.038	0.089 ± 0.063	0.083 ± 0.061	0.087 ± 0.074	0.809
Spherical aberration Z(4,0), 4 mm	$+0.022 \pm 0.031$	-0.008 ± 0.043	-0.011 ± 0.047	-0.002 ± 0.044	0.024
Total HOA RMS, 6 mm	0.251 ± 0.187	0.298 ± 0.283	0.294 ± 0.262	0.283 ± 0.275	0.447
Coma RMS, 6 mm	0.127 ± 0.120	0.167 ± 0.179	0.168 ± 0.177	0.159 ± 0.182	0.494
Trefoil RMS, 6 mm	0.128 ± 0.119	0.131 ± 0.159	0.126 ± 0.137	0.126 ± 0.152	0.636
Spherical aberration Z(4,0), 6 mm	$+0.062 \pm 0.100$	-0.005 ± 0.144	-0.005 ± 0.146	$+0.013 \pm 0.145$	0.035
Corneal total HOA RMS, 6 mm	0.406 ± 0.157	0.569 ± 0.267	0.580 ± 0.288	0.605 ± 0.389	0.130
Corneal spherical aberration Z(4,0), 6 mm	$+0.234 \pm 0.074$	$+0.186 \pm 0.205$	$+0.198 \pm 0.213$	$+0.229 \pm 0.242$	0.009

Values are available-case at each interval (approximate n: preoperative ~2360, 3 months ~585, 6 months ~555, 12 months ~410 ocular; ~2370 / 570 / 530 / 405 corneal), so they differ slightly from the paired preoperative-to-12-month subset in Table 3 and Supplementary Table S4. The P value tests a postoperative time trend across 3, 6, and 12 months (patient-clustered).

Representative de-identified wavefront and corneal tomography (axial anterior curvature) preoperatively and at 12 months, with difference maps, in two cases: (A) myopic astigmatism — total corneal wavefront (MS-39) with tomography; (B) myopia — whole-eye wavefront (OSIRIS-T) with tomography. Patient identifiers are pixelated.



Supplementary Figure S6 (continued). Case B.

